

THE BALTIC AMBER MECOPTERA¹

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The scorpion-flies and their relatives have a long and varied geological record. They are well represented in Permian and Mesozoic strata, which were formed when the order was more extensive than it is now, but poorly represented in Tertiary deposits. Even the Baltic amber, which has contributed enormously to our knowledge of Tertiary insects in general, has yielded very few Mecoptera. Seven specimens, mentioned by Hagen and Pictet a century ago, constitute the only published record of the order in the amber.

The nineteen specimens forming the basis of the present paper have been accumulated since 1931, when my interest in the Mecoptera was first aroused. All of these fossils, except for one belonging to the British Museum, are part of the Harvard collection of amber insects contained in the Museum of Comparative Zoology.²

The seven species represented in the collection belong to the living families Panorpidae and Bittacidae. This is the oldest record of the Panorpidae but not of the Bittacidae, which have already been found in Eocene deposits (Green River). The amber species also belong to extant genera: *Panorpodes*, *Panorpa* and *Bittacus*. The occurrence of the first of these is especially interesting since it now has a very restricted Asiatic distribution. Noteworthy, also, is the close similarity of these Oligocene Mecoptera to living species. This was observed by Hagen (1856), who pointed out that he had difficulty in distinguishing one of the amber species of *Bittacus* from the European *B. italicus*. A comparable similarity between the

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²A comparable collection of amber Neuroptera has also been accumulated and will be considered in a subsequent paper.

amber and extant faunas has previously been observed in most other insect families.

Family Panorpidae

Genus *Panorpodes*

Panorpodes MacLachlan, 1875, Trans. Ent. Soc. London: 188.

Electropanorpa Carpenter, 1931, Journ. N. Y. Ent. Soc., 39:409.

This genus, which is known extant only in Japan and Korea, is represented in the Baltic amber by two species. The generic characteristics are distinctive and can clearly be seen in specimens of both species: a short rostrum, unmodified 7th and 8th abdominal segments of the male, and a definite pleural membrane on the 6th abdominal segment of the male. The occurrence of *Panorpodes* in the Baltic amber, remote from the regions which it now occupies, is noteworthy, for it adds another example of the presence of an existing Asiatic genus in the Baltic region during the Tertiary.

The genus *Electropanorpa*, which I erected for *Panorpa brevicauda* Hagen, now seems to me to be inseparable from *Panorpodes*.

Panorpodes brevicauda (Hagen)

(Figure 1)

Panorpa brevicauda Hagen, 1856, in Berendt's Bernstein befindl. organ. Reste Vorw., 2(1) :91; pl. 8, fig. 21.

Electropanorpa brevicauda Carpenter, 1931, Journ. N. Y. Ent. Soc., 39:409.

Fore wing: length, 11.5-13 mm.; width, 3.5-4 mm.; length of rostrum, 2 mm. Body generally dark brown; wings slightly yellowish, but clear and without maculations; venation as in *Panorpodes*, R1 being posteriorly curved just below the end of Sc; male genital bulb globular, not slender as in *paradoxa*; forceps also are more slender than those of *paradoxa*; hypovalvae extending only to about the base of the forceps. The dorsal surface of the genital bulb is not visible in any of the specimens which I have seen.

The collection at hand contains three males of this insect, all more or less complete (M.C.Z. nos. 5103, 5104, 5105). Hagen based his description of the species on two specimens, one well-preserved male, and the other a fragmentary specimen consisting mainly of the wings.

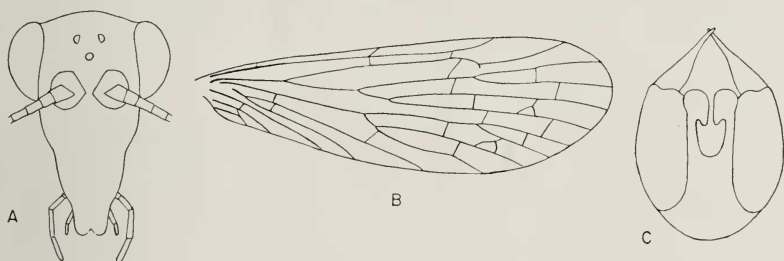


Figure 1. *Panorpodes brevicauda* (Hagen). A, Front view of head; B, fore wing; C, genital bulb of male. All drawings based on specimen no. 5103, M.C.Z.

Hagen's assignment of *brevicauda* to *Panorpa* is not surprising, since at that time (1856) the only two living genera known in the Panorpidae were *Panorpa* and *Chorista*. That Hagen was aware of the peculiarities of the abdomen is clear from his account and from the meaning of the specific name which he used. In my 1931 paper, I called attention to the affinities of *brevicauda* with the species of *Panorpodes*, but concluded from Hagen's figured specimen that the radial sector and media of *brevicauda* had six and five branches respectively, more than is found in living panorpid genera. The additional specimens of *brevicauda* now at hand show that this is not consistently so: the radial sector has six branches in one specimen, five in another, and four in the third; the media has four branches in all specimens.

***Panorpodes hageni*, n. sp.**

Fore wing: length, 13.5 mm., width, 4 mm.; length of rostrum, 2 mm. Body generally dark brown; wings uniformly dark brown from base to apex, with three transverse hyaline bands and a few hyaline spots distally; venation as in *brevicauda*; the genital bulb has the same form

as that of *brevicauda*, but details cannot be discerned because of debris covering part of the body.

Holotype: No. 5106, M.C.Z.; Baltic amber collection; this consists of a complete male.

The generic position of this insect is shown by the structure of the sixth and seventh abdominal segments and the short beak. It is separated from *brevicauda* on the distinctive wing-markings, the wing being essentially dark brown, with hyaline bands. The markings of *Panorpa trizonata* are similar, but include more hyaline areas than those of *hageni*. The wing-markings of the living *Panorpa paradoxa* show great variability, which has caused at least six synonymous species to be established (*apicalis*, *decorata*, *notata*, etc.); but even the most heavily marked individuals do not approach the specimen on which *hageni* is based.

Genus *Panorpa*

Panorpa Linne, 1758, Syst. Nat., 10:551.

The Baltic amber collection includes two species of this genus; a third species may be present, but the specimen (no. 5110) is too poor to permit description. The occurrence of *Panorpa* in the amber is not at all surprising, for it is now the dominant genus of the order Mecoptera, with a very wide distribution. Three species of the genus have been described from mid-Tertiary deposits of Europe and North America, but their reference to *Panorpa* is not necessarily correct, since only their wings are known. The Baltic amber specimens show clearly the head and abdominal structures peculiar to the genus.

Panorpa obsoleta, n. sp.

(Figures 2A and 4A)

Fore wing: length 12 mm.; width, 3 mm.; length of rostrum, 3 mm. Body generally light brown; wings with light yellowish membrane and gray-brown maculations; apical band complete; pterostigmal band reduced to an elongate oblique spot; basal band reduced to two large spots; in the type specimen, Rs has five branches, M, four; 7th and 8th abdominal segments short (fig. 4A), genital bulb rounded, hypovalvae extending to just beyond the

base of the forceps, details of which are not discernible in the fossil; hypovalvae broad, resembling those of the living Japanese species, *Panorpa pryeri* McL.

Holotype: No. 5107, M.C.Z., Baltic amber collection. This is a whole specimen (δ), though parts of the body and wings are obscured by opaque amber.

The wing-markings of this insect, especially the form of the pterostigmal band, are very distinctive.

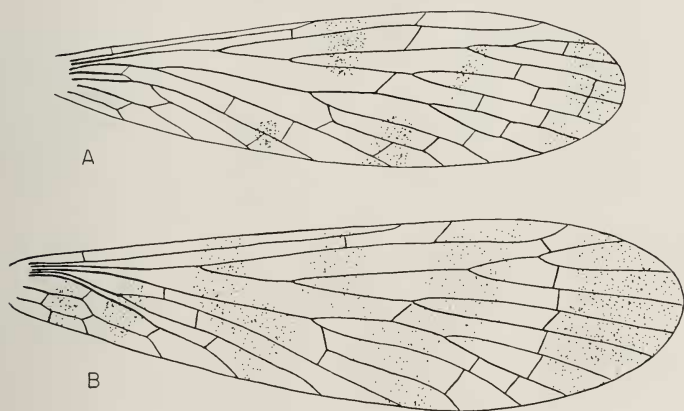


Figure 2. A, Hind wing of *Panorpa obsoleta*, n. sp. (holotype); B, fore wing of *Panorpa mortua*, n. sp. (holotype).

***Panorpa mortua*, n. sp.**

Fore wing: length, 14.5 mm.; width, 4 mm.; length of rostrum, 3 mm. Body generally dark brown, almost black; wing with hyaline membrane and very dark brown or nearly black markings, resembling those of the Japanese *P. klugi* McL.; apical band complete; pterostigmal band complete or nearly so; basal band broad and extensive, almost touching the pterostigmal band; first and second basal spots apparently fused; in the type specimen Rs has five branches and M, four; abdomen with the characteristic form of the genus; the shape of the subgenital plate not discernible.

Holotype: No. 5108, M.C.Z., Baltic amber collection; this is a whole and very well preserved specimen (φ). There are two other females of the species in the amber collec-

tion (nos. 5109 and 5119), with similar dimensions and wing markings.

Family Bittacidae
Genus *Bittacus* Latr.

Bittacus Latreille, 1805, Hist. Crust. Ins., 8:20.

Electrobittacus Carpenter, 1931, Journ. N. Y. Ent. Soc., 39:410.

This is a very widely distributed genus at present, although it includes only about fifty species. The amber collection contains the three³ species described below; a fourth species is also present but is not being described because of the fragmentary nature of the single specimen which represents it. The occurrence of this number of species is striking, since only two species now exist in all of Europe; it substantiates evidence provided by other fossils that the family Bittacidae was more extensively developed during early Tertiary times than at present.

An additional point of interest about the amber *Bittacus* is the small size of certain species. The wing expanse of most living members of genus is at least 34 mm., although in a few species, such as *B. apicalis*, it may be 30 mm. One of the amber species described below (*minimus*) has a wing expanse of 24 mm., and is, I believe, the smallest species of the genus known.

Bittacus fossilis, n. sp.
(Figures 3A and 4B)

Bittacus antiquus Hagen, 1856, in Berendt's Bernstein Befindl. organ. Reste Vorw., 2(1):92; pl. 8, fig. 22 (nec *Bittacus antiquus* Pictet, 1854, Traité Paléontol., :379; pl. 40, fig. 26).

Fore wing: length, 14.5-16 mm.; width, 3.3-3.8 mm.; body light brown; wings uniformly light brown, except for pterostigma, which is slightly darker; no wing markings; venation and wing shape as in figure 3A; a single pterostigmal cross-vein; cubital cross-vein below first fork

³This figure does not include *B. validus* Hagen, which, as I have previously pointed out (1931), can only doubtfully be assigned to the Mecoptera.

of M; no anal cross-vein. Male genitalia as in figure 4B; the copulobi (cl) with deeply incised margins dorsally, forming a posterior lobe; paraprocts (pr) large; spiral filament (sf) forming only part of a single loop, much as in *apicalis*.

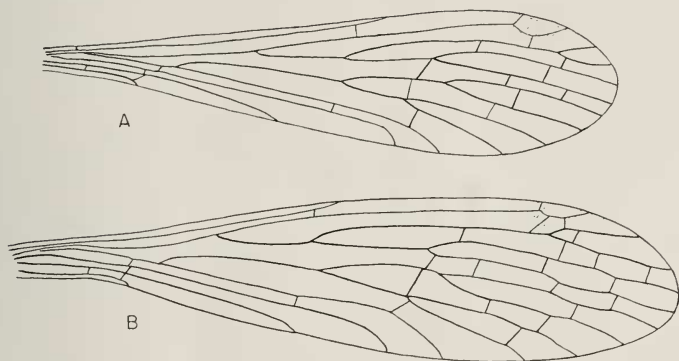


Figure 3. A, Fore wing of *Bittacus fossilis*, n. sp. (holotype); B, fore wing of *Bittacus succinus*, n. sp. (holotype).

There are four amber specimens which I am identifying as this insect: No. 5117, a complete male (fore wing, 15.5 mm. long), with virtually all body structures preserved, including genitalia; No. 5118, a female (fore wing, 15 mm. long), complete except for one pair of wings; No. 5111, a female (fore wing, 16 mm. long), complete except for one pair of wings.

I am convinced that this is the species of which Hagen had four specimens (females) and which he discussed under the name of *Bittacus antiquus* Pictet. The latter was first technically described by Pictet in 1854 (p. 379; pl. 40, fig. 26) from a single, poorly preserved specimen. Hagen reproduced Pictet's original figure and added one of his own (pl. 8, fig. 22). The most notable aspect of Pictet's drawing is the very short beak (much like that of *Panorpodes*); it was this characteristic that induced me to establish the genus *Electrobittacus* for *antiquus* in 1931. Hagen expressed doubt about Pictet's representation of the head, but did not state what his specimens showed in this respect. Significant, also, is Pictet's draw-

ing of the whole insect, depicting a form of wing entirely foreign to the bittacids, but similar to that of most Trichoptera. Hagen's drawing of the wing of one of his specimens, however, is that of a typical *Bittacus* and agrees in venation and size with the wings of a species in the Harvard collection. Since none of the bittacids in this collection has a short beak or a wing-form like that shown in Pictet's figure, I believe that the four specimens which Hagen identified as *antiquus* were not that species. I also believe that Pictet's type specimen of *antiquus* is not a true bittacid; it may have been a trichopteron, but since its identity is very uncertain, I propose that *antiquus*, which now carries the generic name *Electrobittacus*, be considered a *nomen dubium*. The species which Hagen presumably had is described here as *fossilis*.

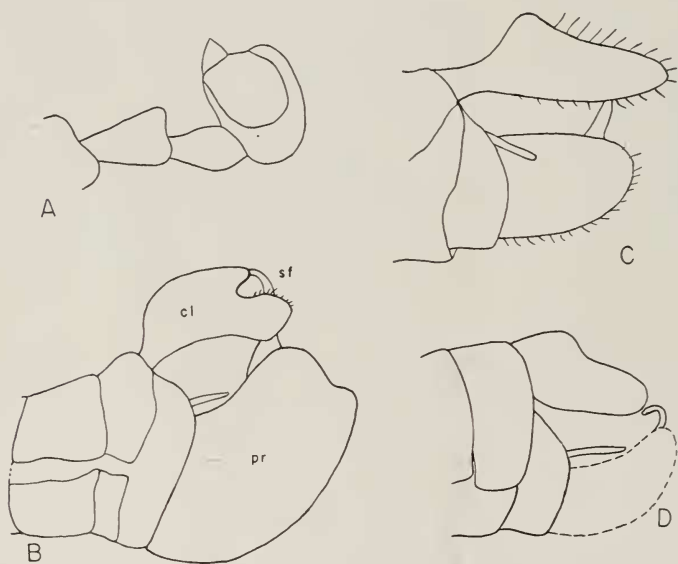


Figure 4. A. Seventh and eighth abdominal segments and genital bulb of *Panorpa obsoleta*, n. sp. (♂, holotype); B. terminal part of abdomen of *Bittacus fossilis* (♂, holotype); C. terminal part of abdomen of *Bittacus succinus*, n. sp. (♂, holotype); D. terminal part of abdomen of *Bittacus minimus*, n. sp. (♂, holotype).

Bittacus minimus, n. sp.

(Figure 4D)

Fore wing: length, 11.5-13 mm.; width, 3 mm.; body light brown; wings uniformly light brown, much as in *antiquus*; no wing-markings; venation as in *fossilis*, with a single pterostigmal cross-vein; cubital cross-vein below first fork of M; no anal cross-vein. Male genitalia as in figure 4D; copulobi short, without a dorsal incision, broad basally; paraprocts apparently small (not clearly preserved); spiral filament small, forming only part of a single loop.

Holotype: No. 5113, M.C.Z., Baltic amber collection; a nearly complete male, clear dorsally but cloudy ventrally; length of fore wing, 13 mm.

In addition to the type, there are three females in the Harvard collection which I believe belong here: No. 5114, a complete and well preserved female, with a wing length of 13.5 mm.; No. 5116, another complete female, with a wing length of 11.5 mm.; and No. 5115, an exceptionally well preserved female, with a wing length of 11.5 mm. There is also a nearly complete female, apparently this species, in the amber collection of the British Museum (No. IN 18855); it has a wing length of 13 mm.⁴

The male on which this species is based is readily distinguished from that of *fossilis* by the different form of the copulobi; but the wings of the two species show no differences, in either venation or form. On the basis of the material at hand, however, I consider *minimus* to be the smaller of the two and I have placed the above-mentioned females here on that basis.

Bittacus succinus, n. sp.

(Figures 3B and 4C)

Fore wing: length, 17 mm.; width, 5 mm.; body and wings light brown; distal part of wings with nebulous dark areas; venation as in figure 3B; two pterostigmal cross-veins; cubital cross-vein below fork of M; no anal

⁴I am indebted to the authorities of the British Museum for the loan of this specimen.

cross-vein. Male genitalia as in figure 4C; copulobi long, narrowed at base, abruptly indented; paraprocts relatively small, not projecting beyond copulobi; spiral filament apparently forming an incomplete loop.

Holotype: No. 5112, M.C.Z., Baltic amber collection; a complete male.

This is a very distinctive species, larger than the two preceding ones and readily recognized by the two pterostigmal cross-veins.